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(Gelatine Print issued only with Imperial Edition.)
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Etchings by Mr. Joseph Pennell.
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House at Avondale, O.

THE SANITAS "RIGHT-HAND" TRAP.

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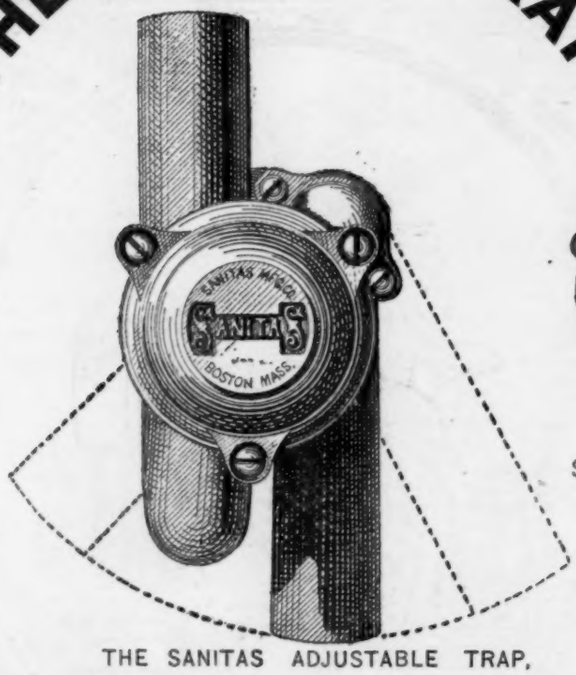
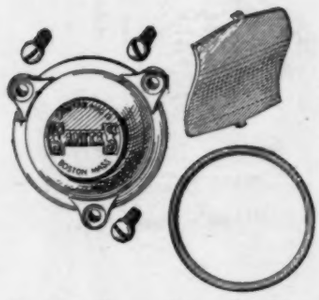
THE SANITAS "LEFT-HAND" TRAP.

THE SANITAS TRAP.

The Sanitas Full S Brass Trap.





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IN the Convention of the Western Association of Architects, held last month, the action of the American Institute in favor of accomplishing consolidation within a year, if possible, was cordially seconded, and a committee appointed to act with the corresponding committee of the Institute in preparing, within the next five months, a definite plan of consolidation, which, after approval by the Trustees of the Institute and the Directors of the Western Association, is to be submitted to the members of both bodies, and a ballot taken upon it by letter. If two-thirds of the members of both bodies vote in favor of it, the plan is to be forthwith adopted, the two bodies declared united under the name of the American Institute of Architects, and a call issued immediately for a convention, at which the business shall be the reorganization of the body now bearing that title, to conform to the new plan of consolidation. There seems to be little doubt that this programme will be carried out, and that the next year will see the complete formation of a new body, strong in its large membership, which, including the present Fellows of the Institute and members of the Western Association, will comprise nearly five hundred of the most conspicuous men in the profession, and ready, we may hope, for the work which will at once be placed upon it. Among the members of the Western Association, particularly, there seems to be a disposition, which is much to be encouraged, to call upon the new body for various services which it will be in a position to render effectively. For example, the question of the employment of clerks-of-works on all important buildings, which was one of the most serious matters to be considered at the recent convention, was immediately referred to the Consolidation Committee, with, apparently, the well-grounded idea that the united body could deal far better with it than any local association, however large. The same action was taken in regard to the proposed formation of State Defensive Leagues, which would certainly, advocated as they are most earnestly by many members of the Western Association, have taken up a good deal of the time of the convention if it had not been at once perceived that the new national body could do this work best. If the persons who have these or any other important movements at heart will be diligent in keeping them before the reorganized Institute, they will confer a double benefit upon the profession. It has long been a reproach to the Institute among the younger architects, and among many of the older ones also, that there was nothing to be gained by joining it, and men who contributed liberally in zeal and money to the local professional organizations have taken a certain pride in holding aloof from the general body, which, as they said, could do nothing for them but put their names on its membership list. To a certain, though small, extent this has been true. The Institute has not been powerful enough in numbers to exert a very great influence on the public, and it has necessarily and wisely been careful not to injure its influence by undertaking to speak too confidently for a profession of which its members formed so small a part. With a quadrupled membership, however, it can justly claim to represent the profession in something like an adequate manner, and, as its suggestions or remonstrances can no longer be met with the sneer that they proceed only from a small local body, it can offer them more boldly, and may be sure that attention will be paid to them. If its Council, for instance, should send a note to the Government of the Commonwealth of Massachusetts, pointing out that all its members had pledged themselves not to enter competitions where the execution of his design, at the usual fees, was not to be the reward of the one placed first by expert judges, and expressing a belief that seven weeks was too short a time to prepare designs for a State-House extension, that note would be read, instead of being thrown into the waste-basket, as would probably be one from the Trustees of the present Institute; and, if attention were not paid to its suggestions by the party in power in the Legislature, the opposing party would come to its aid with energy, in the hope of making a political point. A successful defence of professional principles by the new body in a few instances of this sort would soon attract new members, who would see substantial advantages in a relation which had previously, as they imagined, offered only an empty honor, and with membership influence would increase, and membership again with influence. Of course, hasty or ill-judged action may destroy the authority gained by slow and wise steps, but this is not to be expected from the experienced men who will control its affairs, and a prudent zeal for the interest of the profession will find ample opportunity for exercise for many years to come.

THE Commonwealth of Massachusetts shows a singular ignorance of architects' work by advertising for competitive plans for the extension of the State-House, and allowing until January 20, or about seven weeks, for the completion of the drawings. Three premiums are offered, of fifteen hundred, twelve hundred, and nine hundred dollars, which the Committee probably supposes to be liberal, and, indeed, they are too liberal for the sort of plans that are likely to be made in the allotted time. The problem is an excessively difficult one, the ground on which the extension is to stand being on the side of a steep hill, so that there will be many feet difference in level between the entrance-floor of the new and the old part, and seven weeks would be little enough time, even if an architect had nothing else to do, to devote to the plan alone, without thinking of the elevations, any one of which would need weeks for proper study. We trust that the matter will be reconsidered, and at least six months allowed. The Commonwealth of Massachusetts ought to be sensible enough to reflect that it is poor economy to spend two million dollars in carrying out a crude, ill-considered plan, and, if it is not, architects certainly are, and few of the better class will have anything to do with the competition on the published terms. To say nothing of the impossibility of doing anything creditable within the time allowed, as well as of the strong feeling in the profession against entering competitions for money prizes simply, there have been so many instances of pretended competitions for public buildings, where the offer of prizes for designs to be prepared in an unduly short time served merely as a cover for the award of the commission to some favored individual chosen long beforehand, that architects have learned that it is for their interest to avoid any contest not carried out according to the terms approved by the profession; and, although we are inclined to think that intentional fraud of this kind is less common than is generally supposed, and do not imagine for a moment that anything of the kind is to be imputed to the Legislative Committee of Massachusetts, there ought to be no reason why the Commonwealth should not have the service of the best men in the profession, which it certainly cannot get on the terms which it proposes.

THOSE persons who intend to take part in the Paris Exposition of 1889 must be getting ready. The buildings for the exhibition are nearly done, and some of the articles to be shown must soon be on the ground, to be sure of complete arrangement before May 5, the opening day. There is now no doubt that the affair will be extremely successful so far as the

pleasure of the spectators is concerned, for applications have been received for most of the enormous space available, and many official exhibits will be made. The German Government is almost the only one which has declined to take part, but we understand that it does not forbid its subjects to show their goods, so that its own participation will not be much missed. One very interesting feature will be the exhibits from the South American States. As there is almost no commercial communication between this country and South America, we know much less of the extraordinary development of portions of the continent than the Europeans do, particularly the Italians, to whom Buenos Ayres has become almost what New York is to the Germans. The greatest of all the attractions of the show will, however, undoubtedly be the Eiffel tower, which is almost completed. The latest news about this is that M. Eiffel has sold the right to manage and utilize the tower, during the period of the concession, to a syndicate, of which the principal member is the Franco-Egyptian Bank. As, by the terms of the concession, the tower becomes the property of the Government in twenty years, M. Eiffel could not sell it outright, but, being, as he says, an engineer, and not a showman, he does not wish to be troubled with the details of attracting people into it and gathering their five-franc pieces for the next twenty years, so that he is probably as glad to dispose of his rights as the syndicate is to secure what seems to be so promising a piece of property.

THE English Institution of Mechanical Engineers has invited the American Society of Mechanical Engineers to hold a week's meeting in London next May, and has made promises of entertainment which are calculated to make architects envious. To begin with, an offer has been secured from the Inman Steamship Company to transport members of the Society for one hundred and ten dollars each for the round trip from New York to Liverpool and back, if all the members go from New York on the same steamer. Returning, round-trip tickets will be available for any steamer of the line during the remainder of the year. If the party going out numbers one hundred and fifty persons or more, the Company will reserve a steamer, either the "*City of Chester*" or the "*City of Richmond*," for its exclusive use, retaining for it the whole first cabin. On the arrival of the visitors in England, they are assured invitations from various scientific bodies in France and England to inspect works of interest, and the lines of railway from Liverpool to Paris have promised to convey the party as their guests by special trains, while private hospitality will be cordially extended. It is expected that this very kind and sincere invitation will be enlarged, as soon as the necessary arrangements can be made, to include the American Society of Civil Engineers and the Society of Mining Engineers, and in that case the party of one hundred and fifty is pretty sure to be made up.

SOME extraordinary science seems to have illuminated the recent meeting of the American Gaslight Association at Toronto, during a discussion upon the remedies to be applied in cases where persons were suffering from the inhalation of gas. It is not uncommon for the workmen of the gas-companies, in looking for leaks or digging up broken pipes, to be overcome by the gas, and, according to the accounts of the treatment to which they are subjected by the surrounding philanthropists, they seem to be fortunate if they escape with nothing more than a temporary loss of consciousness. One of the participants in the discussion had had the prudence to ask advice on the subject from a physician, who gave him a sensible set of rules, consisting mainly in directions to give the sufferer plenty of air and administer a little brandy and water, assisting respiration by artificial means if necessary. Another one had heard, also from a physician, that sweet oil might be administered with advantage, and had used this remedy in many cases with excellent results, which he attributed to the efficacy of the oil, when swallowed, in "lubricating the breathing apparatus," so that recovery followed rapidly. Another gentleman had had a somewhat different experience. On one occasion, when seven of his men were found insensible in a trench from an escape of gas, he had them carried into a purer atmosphere, sprinkled with water, and dosed with whiskey and water until they were sufficiently restored to eat, and then gave them apples. After they had devoured these, it was found that "the acid of the apples immediately started the gas out of their stomachs," and they were soon able to drink some coffee and walk home. A similar method of "starting the gas out of the stomachs" of his men with acids had been tried by a third member, who, however, used vinegar instead of the acid of apples. The fourth remedy mentioned was not an amateur device, but the prescription of a physician, who was said to have on two occasions treated men overcome with gas by injecting carbonate of ammonia. Whether this application was intended to "lubricate the breathing apparatus" or "to start the gas out of the stomach" we are not informed, but it is not surprising to hear that the patient was ill for eight or ten days afterward. A much-disputed point, that of the relative poisonous effects of coal and water gas, was touched upon by one of the speakers, who said that the effect of the inhalation of water-gas was "a very serious matter indeed," and "entirely different" from the effect of coal-gas. In his practice extra precautions were taken in dealing with water-gas, and men did not recover from the effect of inhaling it for some weeks.

SINCE the recent explosion of a petroleum vessel in Calais Harbor, experiments have been made to determine what proportion of petroleum vapors mixed with a given amount of air will form explosive compounds. In mixing ordinary illuminating-gas with air, it is found that one part of gas to eight of air gives the most violent explosion, and with the vapor of the volatile portions of petroleum nearly the same observation is made. With one part petroleum vapor to five of air no explosion takes place. With six parts of air there is a feeble explosion, and with from seven to nine parts a very violent one. With twelve parts of air the detonation is still violent, but with sixteen parts it becomes feeble, and with one part vapor to twenty of air there is ordinarily no explosion. The conclusion which the *Revue Industrielle* draws from these observations is that accumulations of stagnant air in petroleum ships are very dangerous, and it suggests further that if fires should occur in them, they might be advantageously treated by the method now used in oil refineries, where pipes and pumps are always ready for forcing water in at the bottom of the great tanks, while a siphon extends from the upper portion of the tank to a place of safety. If one of the tanks should take fire the pumps are started, and the water forced in from below raises the level of the oil, which begins to run off through the siphon. As the opening of the siphon is below the surface of the oil, the flames which rage above cannot get into it, and the unconsumed oil is drawn quietly away from within a few inches of a conflagration which the bravest firemen cannot face, until most of it is safely transferred to another receptacle, and the portion which is left in the original tank is so small that it is soon consumed, and the fire goes out for want of fuel.

A CURIOUS device for testing the dryness of walls is described in the *Wiener Bauindustrie-Zeitung*. The apparatus for the purpose consists simply in small sheets of gelatine, which are made by taking the sheet-gelatine of commerce, selecting the thinnest pieces, soaking them for a quarter of an hour in water until they are quite soft, spreading them out flat on a greased sheet of glass, and stretching them with the fingers until the folds and creases are smoothed out, and the whole made as thin and uniform as possible. The sheets are then thoroughly dried in the air, the edges, which are rough and uneven, are trimmed off, and the whole cut into pieces about two inches wide and four inches long, for use in testing. If kept flat in a dry place, these gelatine strips are very sensitive to moist air. If a wall is suspected of being damp, a strip is moved slowly over it near its surface, but not touching it. If any damp spots exist, they are immediately shown by the curling of the gelatine as it passes near them. Although every one takes some interest in knowing whether his house is dry or not, this simple test is likely to be of more practical use to fresco-painters and paper-hangers than to any one else. Both of these, to avoid disappointment and loss, need to know with certainty whether the walls and ceilings on which their art is to be exercised are dry or not, as their papers and colors will often change on damp plastering. In the case of a wall of masonry, particularly, plastered on the brickwork, it is difficult to tell by ordinary inspection whether the moisture has dried out or not, and the gelatine sheets may give the desired information with such certainty and precision as to be of great service.

BUILDERS' HARDWARE.[1]—XV.

SASH-HOLDERS AND SPRINGS.

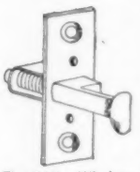

Fig. 216. Window spring. P. & F. Corbin.

THE sash-fasts which have been described up to this point, have been those intended for use in connection with double-hung windows; and, while any of them could be used with a window having double sashes which are simply set in the frame, without weights or balances of any description, there are a few appliances especially intended for windows without weights, which can best be considered in this connection. "Hammond's" window-springs are used so extensively for this purpose that they are almost standard. The springs are simply flat bands secured to the hanging-style and catching in ratchet cuts on the edge of the sash, each spring having a bent handle or thumb-piece coming out in front of the sash. One spring is used for each sash. A different form of spring is shown by Figure 216. This is mortised into the hanging-style and catches into square cuts on the edge of the sash, the thumb-piece showing in front. Figures 217 and 218 show two forms of window-springs on an entirely different principle. The portion containing the spring is mortised into the sash, the lever showing in front of the glass. In the first instance the spring is exposed, and catches on posts set in mortised plates at intervals on the hanging-style. In the latter example, the spring is concealed, the end of the lever hooking into plates of the shape shown by the figure, which are mortised into the hanging-style. These springs also serve as holders, the ends of the levers pressing strongly against the hanging-style and holding the sash from slipping.

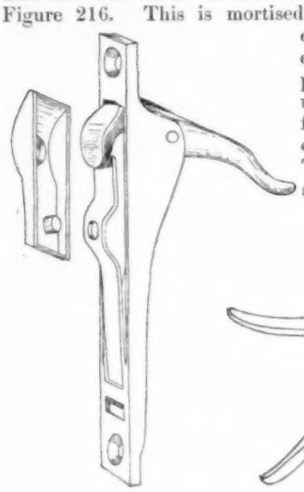

Fig. 217. Sweet's Window-spring. Stanley Works.

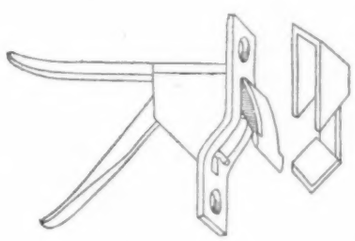

Fig. 218. Northrup's Window-spring. Stanley Works.

Fig. 219. Sash-roller. P. & F. Corbin.

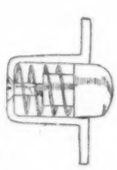

Fig. 220. Ayer's Sash-holder. Ayer's Sash-holder Co.

Fig. 221. Byam's Sash-balance. Byam, Stewart & Baker.

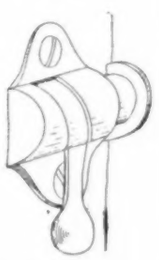

Fig. 222. Sash-fastener. Stoddard Lock & Mfg. Co.

A sash-holder is something intended to keep unweighted sashes in any given position by friction on the jambs of the frame. Besides the two previous forms, there is a very simple device consisting of a wooden or vulcanized-rubber roller, Figure 219, mortised into the sash and bearing against the window-frame. There is also the "Ayer" sash-holder, Figure 220, better adapted to its purpose than any wheel could be, consisting of a round peg mortised into the sash and pressed constantly against the hanging-style by means of a strong spiral spring. Still another form is shown by Figure 221. This is mortised into the hanging-style, and consists of a small wooden cylinder, or roll, laid loosely in a slot and against a heavily milled surface which prevents it from rolling down. The milled plate is backed by a heavy steel spring. When the sash is lifted, the roll turns easily in the slot; but, when the sash is being lowered, the wooden roll wedges between the milled-plate and the edge of the sash, offering a resistance in proportion to the stiffness of the spring.

Figure 222 illustrates an appliance which can be used as a sash-fastener, but which is intended more especially to bind the sash so it will not rattle. It consists of a plain bolt sliding in a case attached to the window, with a lever working in an oblique slot, so that when it is drawn down, the bolt is pressed out with considerable force, and holds by friction against the jamb. Figure 223 shows another anti-rattling device, a metal surface on the sash which wedges against an inclined plate on the jamb; and Figure 224 is the simplest of all, a metal wedge, suspended by a small chain attached to the sash, which can be inserted in the joint between the sash and the stop-bead.

Fig. 223. Clauson's Anti-rattling Wedges. Sise, Gibson & Co.

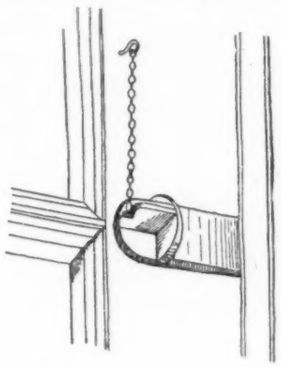

Fig. 224. Ideal Anti-rattler. American Mfg. Co.

The following table gives the average retail prices per dozen of the sash-fasts, etc., referred to in this chapter:

The prices are for plain goods, when such are manufactured.

TABLE OF SASH-FASTS, ETC.

Fig.	Name.	Bronzed Iron	Brass or Bronze.
181	Yale & Towne sash-lock	——	$12.00
182	King sash-lock	$2.50	——
183	Sash-fast, P. & F. Corbin	1.00	2.50
184	Sash-fast, Russell & Erwin	1.35	6.60
185	Judd sash-fast	1.38	4.00
186	Sash-fast, Norwich Co.	1.15	3.30
187	Sash-fast, P. & F. Corbin	——	6.00
188	Metropolitan sash-fast	3.00	7.50
189	Boston pattern sash-fast	1.50	6.00[1]
——	Ladd sash-fast	2.30	7.00
190	Sash-fast, Hopkins & Dickinson	1.60	5.00
191	Sash-fast, Stoddard	1.00	4.50
192	Favorite sash-fast	1.00	3.50
193	Sash-fast, Yale & Towne	——	6.00
194	Morris sash-fast	1.68	4.20
195	Triumph sash-fast	1.68	4.20
196	Sash-fast, P. & F. Corbin	.88	——
197	Mathes's sash-fast	1.50	3.70
198	Payson's sash-fast	1.00	4.00
199	Ives' sash-fast	1.00	3.50
200	Sash-fast, P. & F. Corbin	.60	2.50
201	Ticket-office sash-fast	——	6.00
202	Robinson's sash-fast	——	6.00
——	Security sash-fast	——	3.75
203	Shaw's sash-fast	——	5.00[2]
204	Davis sash-fast	3.60	5.85
205	Byam's sash-fast	1.00[3]	4.20
207	Timby sash-fast	——	1.00[4]
208	Atwell sash-fast	3.00	6.00[2]
209	Brown's window-lock	.60	.75[2]
210	Eccentric sash-fast	.12	——
211	Sash-lock	.33	——
——	Hammond's sash-springs	.70[4]	——
216	Window-spring, P. & F. Corbin	——	.58
217	Sweet's window-spring	1.25[5]	
218	Northrup's window-spring	1.25[5]	
220	Ayers' sash-holder.		
221	Byam's sash-balance	7.20[3]	
223	Clauson's anti-rattler, per set	——	.18
224	Ideal anti-rattler	——	.60

[1] Price in Bower-Barffed iron, Yale & Towne Mfg. Co., same as in bronze.
[2] Nickel plated.
[3] Plain iron only.
[4] Japanned iron with silver-plated knobs.
[5] Japanned iron.
Face-plate only of bronze.

[1] Continued from page 266, No. 676.

There is also a very satisfactory and simple device consisting of a plain, hard-rubber button with a milled edge which is screwed on to the bead and against the sash, so as to turn when the window is opened. This is known as "Patten's" window-tightener. It is manufactured by the Portsmouth Wrench Company, and retails at 4 and 5 cents per hundred. The same, or a much similar form, is manufactured by the Ayer's Patent Sash-Holder Company.

"Nelson's Perfect Fastener," is a name applied to a device for screwing the stop-bead to the window-frame; it consists of metal eyelets which are sunk into the bead, with an ecliptical instead of round hole to receive the screw. As the longest dimension of the screw hole is in a horizontal direction, the bead can be set so as to permit of a play of quite a quarter of an inch. Such a contrivance must prove a boon to those who are suffering with windows which bind in summer and rattle in winter. The fasteners cost from $2 to $3.25 per gross, including either round or flat headed screws.

SASH-LIFTS.

Sash-lifts are often omitted from architects' specifications, though they are usually very desirable, and when properly applied, will save a great deal of wear on the sash. The common form of lift is shown by Figure 225. A form which is not quite as convenient to use, though sometimes preferred, is the flush lift, the type of which is similar in the

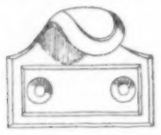

Fig. 225. Ordinary Sash-lift.

Fig. 226. Byam's Sash-lifter. Byam, Stewart & Baker.

Fig. 227. Sweet's Reversible Sash-lift. Stanley Works.

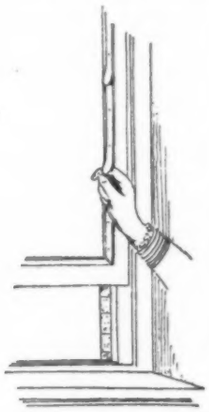

Fig. 228. Wigger's Sash-lifters. Brainerd & Co.

main to Figure 225. Both of these are intended to be attached to the bottom-rail of the lower sash. Figure 226 is a species of sash-lift which is applied over the mouldings of the sash-styles, in the shape of a concave strip of metal, with shoulders

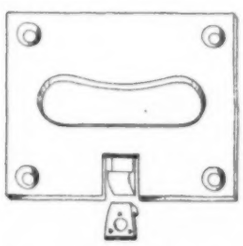

Fig. 229. Flush Sash lift and Lock. Ireland Mfg. Co.

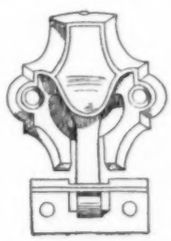

Fig. 230. Sash lift and Lock. Ireland Mfg. Co.

at intervals. Figure 227 is in the form of an angle-iron, likewise secured to the sash mouldings, and Figure 228 shows a form which can be applied either over the mouldings or on the face of the sash.

Figures 229, 230, 231 and 232 show four styles of combined sash lift and lock. No. 231 works by gravity. The others are each fitted with a spring which forces out the catch so that it will hold on the sill-plate or catch. Figure 233 shows a very practical form of sash-lift so arranged that by pressing down the lever handle a great lifting power can be applied, sufficient to start and lift a heavy sash, or to start a sash that has become wedged or frozen in. After the sash is started, the lift is in the right position to raise it with ease, and when the window is closed the lift can serve as a lock, by turning a button which will prevent the lever handle from moving.

Figure 234 shows two of the common forms of casement or

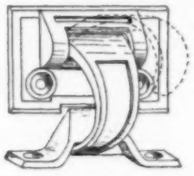

Fig. 231. Sash lift and Lock. Russell & Erwin.

Fig. 232. Sash lift and Lock. P. & F. Corbin.

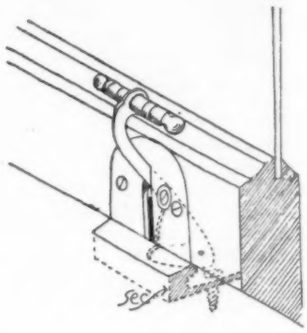

Fig. 233. Anderson Sash-starter.

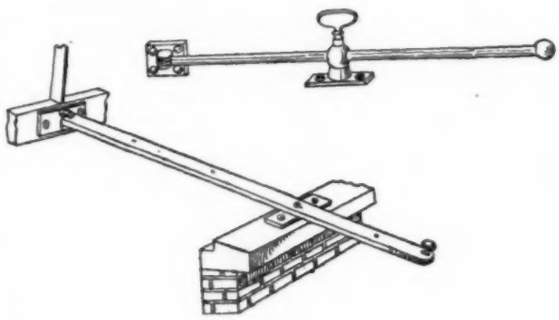

Fig. 234. Sash-openers.

hinged sash-openers. These are best made to order, but can be had in stock, 12, 15 and 18 inches long, and cost from 50 cents to $1 each, depending on the metal and the finish.

TABLE OF SASH-LIFTS.—AVERAGE RETAIL PRICES PER DOZEN.

Fig.	Name.	Bronzed or Japanned.	Brass or Bronze.
225	Common sash-lift	$ .30	$1.35
	Flush sash-lift	—	2.00
226	Byam's sash-lift	.30	.90
227	Sweet's sash-lift	.25	—
228	Wiggers's sash-lifts	1.50	2.25
229	Sash lift and lock, Ireland Mfg. Co.	2.70	4.80
230	Sash lift and lock, Ireland Mfg. Co.	2.10	4.20
231	Sash lift and lock, Russell & Erwin	1.00	4.00
232	Sash lift and lock, P. & F. Corbin.	.80	3.20
233	Anderson's sash-starter	6.00	9.00

[To be continued.]

The Dangerous Theatre Chandelier.—At last somebody has been killed by one of the swords of Damocles, in the shape of huge and tottering chandeliers, which theatrical managers insist on hanging over the heads of their audience. The glass drop descended on a gentleman in the stalls at the Paris Lyrique theatre and killed him on the spot. The audience, however, were not upset by the incident. They had paid their money and they insisted on seeing the play out. *Si fractus illabatur orbis, Impavidum ferient ruinæ*, which may be translated (for this occasion only): "If the globe of the chandelier breaks to pieces on somebody else's head, you bear the smash without a shiver."—*St. James's Gazette.*

THE HITTITE REMAINS.

IN the year 1879 the mounds of Jerablous, on the Euphrates, six hours below Biridjik, were identified by Mr. Henderson, the English Counsel at Aleppo, as the site of "Carchemish," the capital of the ancient but long-lost nation of the Hittites. Soon afterwards the American missionaries visited those mounds and examined them with deep interest, and as they toured through their mission fields from time to time, they scrutinized every fragment of chiselled stone in search of Hittite sculptures and inscriptions.

Two lions of black basalt were found on the top of the wall of the old Genoese Castle, in the city of Marash, guarding the entrance. Their workmanship was so unlike the other ornamentations of the wall, that it was but natural to infer that they were made for some other purpose.

One of them was covered with hieroglyphics in the same character as those at Carchemish. They were found also to be identical with the mysterious writing on the Hamath blocks in the museum at Constantinople. The inscriptions are in raised characters, arranged in horizontal bands, four inches wide, extending from left to right and then right to left, with a raised line separating the bands from each other.

Among the characters appear the heads of men, oxen, goats, hares and other animals, human hands, feet and faces with rings in the lips, and many other similar figures and others still, which, in their present form, do not seem to represent any natural object. The smaller characters are written one above another between the lines, but the larger forms extend nearly from line to line.

The faces and feet on the first band all look toward the right, but on the second they look toward the left and continue alternately in the same order, indicating the direction in which the writing must be read. These inscriptions bear very little resemblance to any known system of writing, and no attempt to decipher their meaning has thus far been successful.

Near the base of the fort was found the colossal trunk of a human statue or an idol, which must have been nearly eight feet in height. The head and both feet have been broken off. This large trunk now serves as a step in the stairway of a mosque.

On a grave in the Christian cemetery was found a slab of black basalt, four feet in length, two in width and one in thickness. The upper surface only had been trimmed, and contained in bas-relief a human figure dressed in a long tunic fastened by a girdle. In the hand was a wand or staff. The beard resembled that of the Assyrian sculptures, but the hair was long and gathered at the back of the neck in a peculiar roll turned upward. The shoes were painted and turned up at the toes. These peculiarities are characteristic of nearly all Hittite sculptures.

This slab also contained an inscription covering its entire face, the bands of hieroglyphics extending back and forth across the human figure, but the characters differ from others in being incised instead of in relief. They were, however, much defaced. Fifteen to twenty other slabs of the same general character have been discovered in Marash. One is the door-step of a minaret, another is in the pavement of a door-yard, another still, containing the figure of part of a chariot, serves as a horse-block at a street door. One heavy slab was found lying on its face four feet under ground in a vineyard, on which was represented two human figures sitting in chairs on either side of a cross-legged table, on which were plates of bread and fowl. These slabs are all of black basalt, having only one face of the stone trimmed; the figures are in bas-relief and the inscriptions all in the same characters, though there is variety of form corresponding to the hand-writing of different men or possibly of different times.

The lion on the fort has recently been transferred to the Royal Museum, Constantinople, and two or three small slabs have been carried away by European travellers. Others remain where they were discovered.

The lions on the fort, the trunk of the idol, and several other blocks near its base suggest that the natural mound on which the fort was built may once have been crowned with a Hittite palace or temple, and a block found on the side of the mound — perhaps a piece of an altar containing on two sides a beautifully cut inscription, but charred and cracked by heat — bears silent testimony to the method by which the building was destroyed. There seems abundant evidence that Marash was an important Hittite city, and many relics of its ancient buildings doubtless lie buried under the present streets and walls. Several interesting Hittite slabs have been discovered in the Albustan plain, eighty miles north of Marash; also a fine inscription near Room Kala, sixty miles east on the Euphrates.

Other blocks with the peculiar chiselling of the Hittites have been found in different places on the plains from twenty to fifty miles south of Marash.

It is well known that the plains of Central Turkey are scattered over with mysterious mounds of earth. They are of different sizes, but generally covering from two to four acres and are fifty to seventy-five feet in height, with a level acre on the summit. They are seen only on the plains, in all cases several miles from each other and in nearly every instance close by a fountain of water. Some suppose they were watch-towers, others that they supplied the place of a fort, the people gathering on the summit to defend themselves from the attacks of horsemen who could not ascend the steep sides; still others hold that they are monuments over the tombs of buried kings, while there are not wanting those who think that they are merely natural formations; but the fragments of pottery and the alluvial soil that compose them prove their human origin.

In modern times a rude Turkish village often appears at the base and part of the way up the side of a mound; in other cases the whole mound is covered with a vineyard or a wheat field, or its steep sides are perforated with the dens of foxes and jackals.

No light is to be found concerning them in written history, except in the Assyrian department of the British Museum, where, upon an immense block of stone, the representation of a multitude of men actually engaged in building such a mound may be seen. Some of these mounds, which are very regular, may have been built for a special purpose now uncertain, but others, irregular in form and larger in area, must have been formed by the débris of mud walls and roofs.

One of this latter class of mounds on the plain near the eastern base of the Amanus Mountains, about fifty miles south of Marash, has attracted the attention of the American missionaries for some years, and at their suggestion several travellers have visited it. The little Turkish village of Zenjirli is built on the side of a mound.

The special interest connected with it was a dozen slabs of black basalt four feet high and two feet square, at the ends forming a re-entrant angle at one edge of the mound near the base and apparently extending farther in towards the centre to complete the basement walls of a building. On the face of each block were Hittite bas-reliefs.

The attention of American antiquarians was called to this mound, and it was hoped that American enterprise would undertake its exploration. The past winter a party of Germans, under the patronage of their Government, have commenced the work of excavation, and one hundred laborers in a few weeks' time laid bare a large number of blocks forming, as had been supposed, the basement of a Hittite palace. They were nearly all *in situ*, resting upon rude foundations of masonry. A line of blocks extends along the entire front, then opens mid-way into an entrance-hall, which soon widens into a court about forty feet square. A narrow hall connects this court with another large court farther within, which has been uncovered only in part, but seems to be several rods square. These halls and courts are lined by a single row of basalt blocks, each standing on end and nearly every block contains on its inner surface a Hittite sculpture.

At one place is a hunting scene continued along a dozen blocks. The men are armed with daggers, spears, and the bow and arrow. Deer, rabbits and birds represent a variety of game. At the entrance to the main court on either side are the bas-relief sculptures of an immense lion looking toward the outer door, and behind each lion stands a heavily-armed soldier. The superstructure, resting upon these Hittite blocks, must have been made of sun-dried brick and perhaps in part of wood. The stones bear evidence that the buildings above them were burned. The pile of earth that forms the mound must be the débris of mud roofs and walls from Hittite palaces to the peasant hovels of modern times.

No Hittite hieroglyphics have yet been discovered, but the most remarkable "find" is the colossal statue of Sardanapalus, King of Nineveh, eighth century, B. C., standing on a pedestal in the smaller court of the palace. The workmanship is very fine. The face speaks like the finest Grecian statues. The statue had been thrown down and broken, but the fragments are all there and the whole figure can easily be restored. On this statue were several square yards of Assyrian inscription in cuneiform hieroglyphics, from which the name was determined.

But how this statue of an Assyrian king came to be placed in a Hittite palace is not easily accounted for. It is presumed that when Sardanapalus made his expedition through Asia Minor he conquered this Hittite city and erected his own statue in the centre of the palace, carefully preserving intact all the productions of Hittite art.

Several shafts have been sunk in different parts of the mound, but thus far no other important results have been reached. A few feet below the surface in various places were found the rude foundations of mediæval and Roman peasant huts with stone hand-mills, mortars, jars and other relics of those periods. One shaft reaching to the level of the plain disclosed a colossal image of an animal designed for a lion, but its rude workmanship belongs to an early period in the art of sculpture. There are traces also of a wall and moat a few rods distant inclosing the mound. Opposite the entrance to the palace a dozen sculptured blocks have been uncovered. They mark the gate-way in the city wall.

The Germans propose to continue their excavations three years and turn over with the spade the entire mound.

The great desideratum in Hittite discoveries is a bilingual inscription to be used as a key to interpret the mysterious hiero-

glyphics. Nothing of the kind has yet appeared, except a very brief inscription on a silver boss, which a few years ago was offered for sale in Constantinople and fortunately copied, but the original has mysteriously disappeared. The languages were Hittite and Assyrian cuneiform, giving the name of a king and of his country, but both were unknown to history.

The Germans have also discovered in a Turkish cemetery near Zenjirli a human statue with nearly a square yard of inscription in what seems to be Phœnician characters.

Hittite remains have been discovered at different points in Central and Southern Asia Minor extending as far west as Smyrna and east to the Euphrates. Bible history also speaks of these people at Hebron, in Southern Palestine. They are not only many times mentioned in the Assyrian inscriptions exhumed from the mounds of Koyounjuk and Khorsabad at Nineveh, but also the mightiest of the Pharaohs of Egypt, when to glorify themselves they delineated their personal achievements upon the lofty pylons at the entrances of their temples, could find no prouder record of their valor than the representations of their victories over the Hittites. Rameses II, at Karnak and at the Rameseum, thus not only records his own brilliant victories, but undesignedly bears testimony to the strength and courage of those whom he calls "the despised Hittites," whose power he overcame with so much difficulty. It is an interesting fact that the treaty of peace between the Hittites and the Egyptians is engraved upon a stone tablet in the walls of Karnak, and is the first treaty of peace on record. The Hittites were known at Jerusalem, Thebes and Nineveh for the period of one thousand years.

This mysterious nation has now been lost to history for twenty-five hundred years, and it is very remarkable that all traces of its existence, except the few brief references in the Bible, are inscribed on tablets of stone. These people chiselled their bas-reliefs and hieroglyphics upon black basalt, even the most durable stone in the land, and in the destruction of the temples and palaces these precious slabs were buried deep under mounds of earth and kept for distant ages more safely than they could have been in any museum or library. The enemy did not take in all this when he threw his firebrand into the palace halls.

It is not surprising that these mementos of such a lost nation, as they come to light one by one, should awaken a deep interest in the civilized world.

The experiment at Zenjirli suggests possibilities of the deepest moment. Hundreds of similar mounds in southern Asia Minor and in Mesopotamia are waiting for the spade to reveal their treasures. They may not all contain the ruins of palaces, temples, stone libraries, or works of art, but it is a remarkable fact that the first mound opened in Central Turkey contained a genuine palace, a statue of a king of Nineveh with an extensive Assyrian inscription, and also nearly or quite as many works of Hittite art as all others that have hitherto been discovered.

There is here surely a wide and intensely interesting field for investigation. The American missionaries, the only Americans on the ground, have neither the time nor the means to prosecute such enterprises, but it is earnestly desired that the American people assume a share in the search for the records of this long-lost nation.

Erhard Bissinger, *U. S. Consul.*

Beirut, September 22, 1888.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF HENRY H. COOK, ESQ., COR. 78TH ST., AND FIFTH AVE. NEW YORK, N. Y. MR. W. WHEELER SMITH, ARCHITECT, NEW YORK, N. Y.

[Gelatine print, issued only with the Imperial Edition.]

HOUSE OF GEORGE COMSTOCK, ESQ., BRIDGEPORT, CONN. MR. J. W. NORTHROP, ARCHITECT, BRIDGEPORT, CONN.

This is a frame building, the exterior shingled and clapboarded; roof slated. The interior is finished in natural woods, the first story in oak, mahogany and cherry, the second story in white wood. The house is heated by indirect steam. Cost a little above $10,000.

ETCHINGS BY MR. JOSEPH PENNELL. — CHANCERY LANE, PHILADELPHIA, PA.; AN ALLEYWAY, PHILADELPHIA, PA.; THE LANDING-PLACE, LEGHORN, ITALY.

See article elsewhere in this issue.

VIEWS AT WISBY, SWEDEN.

Wisby is the capital of the Island of Gottland.

HOUSE OF C. F. LOUDON, ESQ., AVONDALE, O. MR. S. E. DES JARDINS, ARCHITECT, CINCINNATI, O.

JOSEPH PENNELL, ETCHER AND ILLUSTRATOR.

A Sienese Street.

Whether there is a cause for it to be found in the traditional sobriety of tone characterizing the old Quaker City, I know not, but Philadelphia is, undoubtedly, the home of a remarkably large number of distinguished artists in "black and white." Among her sons and daughters, native or adopted, are, or have been, for death, alas! has claimed some, such illustrators as James Hamilton, H. L. Stephens, Darley, Abbey, Frost, F. B. Schell and E. B. Bensell; such etchers as Parrish, Thomas Moran and his wife, Mrs. Mary Nimmo Moran, Peter Moran and his wife, Mrs. Emily Moran, S. J. Ferris and his son Gerome Ferris, William Sartain, Mrs. Anna Lea Merritt, Miss Edith Loring Peirce (now Mrs. Getchell), Miss Gabrielle Clements, Miss Blanche Dillaye and Miss Mary Cassatt, with others; and such steel-engravers as Longacre, Alexander Lawson, Hinshelwood, Whitechurch, the veteran John Sartain, his son Samuel and his daughter Emily. The frequency of feminine names in these lists is significant, and one more can be added, that of Miss Alice Barber, who is both wood-engraver and designer. Another Philadelphian, able to charm without the aid of color, was William H. Furness, whose refined crayon portraits are treasured in many a home.

Mr. Joseph Pennell has already made a distinct and valuable addition to the sum of monochromatic art achieved by the artists noted in my hasty and, doubtless, incomplete survey, and his youth warrants us in expecting much more. Born in Philadelphia thirty years ago, he studied at the Pennsylvania Academy of Fine Arts, the oldest institution of the kind in the United States. Beyond this, he does not appear to have received any regular instruction, but worked from Nature, aided by experience — expensive but most impressive taskmaster — and so far as the technicalities of etching are concerned, gathered them from the treatises of Hamerton and Lalanne. At first Mr. Pennell etched both out-of-doors and from sketches, but, I believe, that he has long since abandoned the latter method, and now works only directly from nature on the plate. His earliest etchings date from 1880 or 1881, and were reproductions of quaint old bits of his native city. These were followed by some etchings of scenes in New Orleans; and, then, in 1883, he went abroad, where he still remains. It was towards Florence that he first turned his steps, and some of his best plates were done there, the "Swing of the Arno" and other presentments of the river, with its bridges, and the roofs and streets of the city of Dante, of Savonarola and of Michael Angelo. These were supplemented by etchings done at Siena, at

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FIRST FLOOR PLAN.

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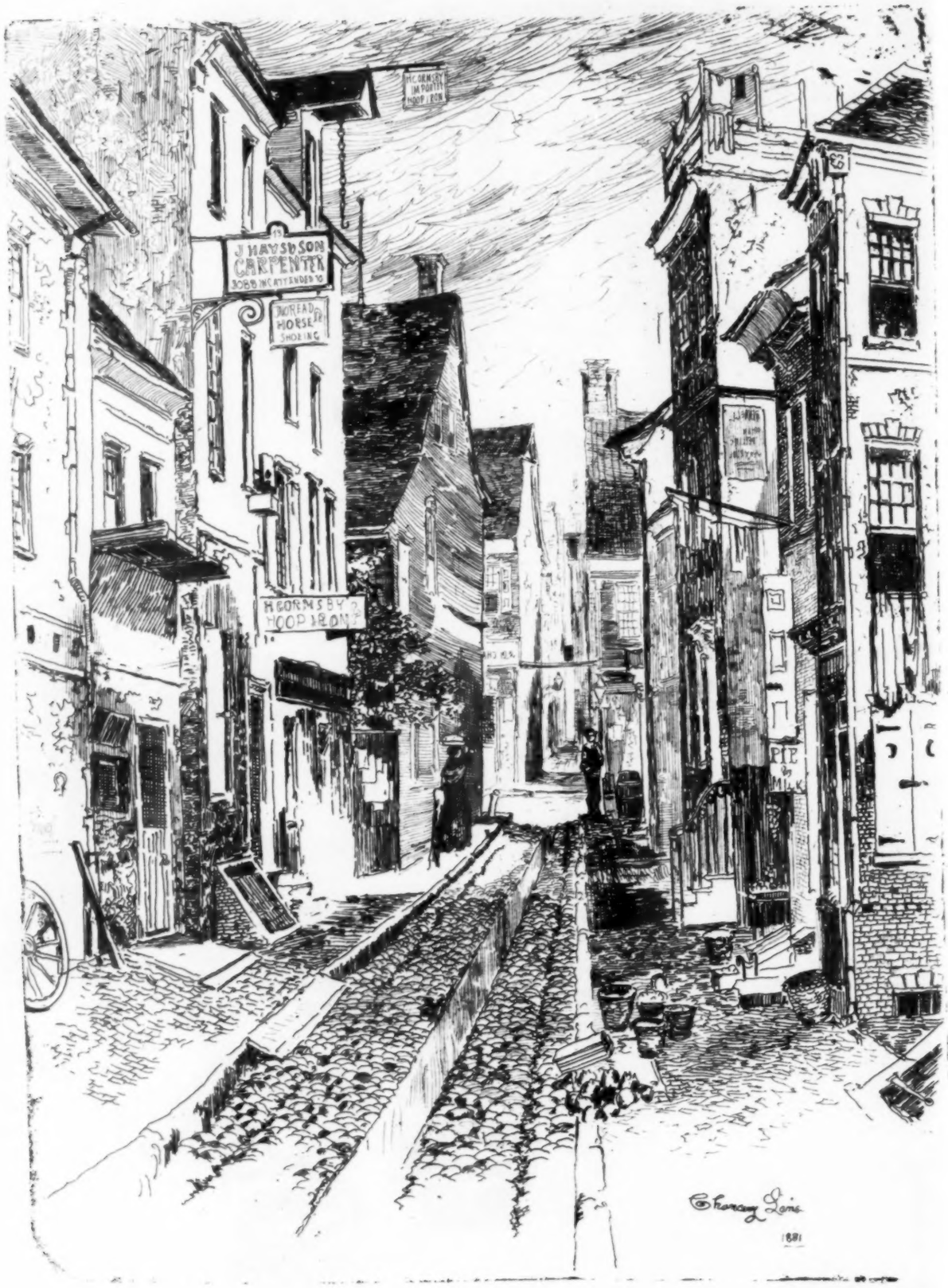

Heliotype Printing Co. Boston

CHANCERY LANE, PHILADELPHIA.

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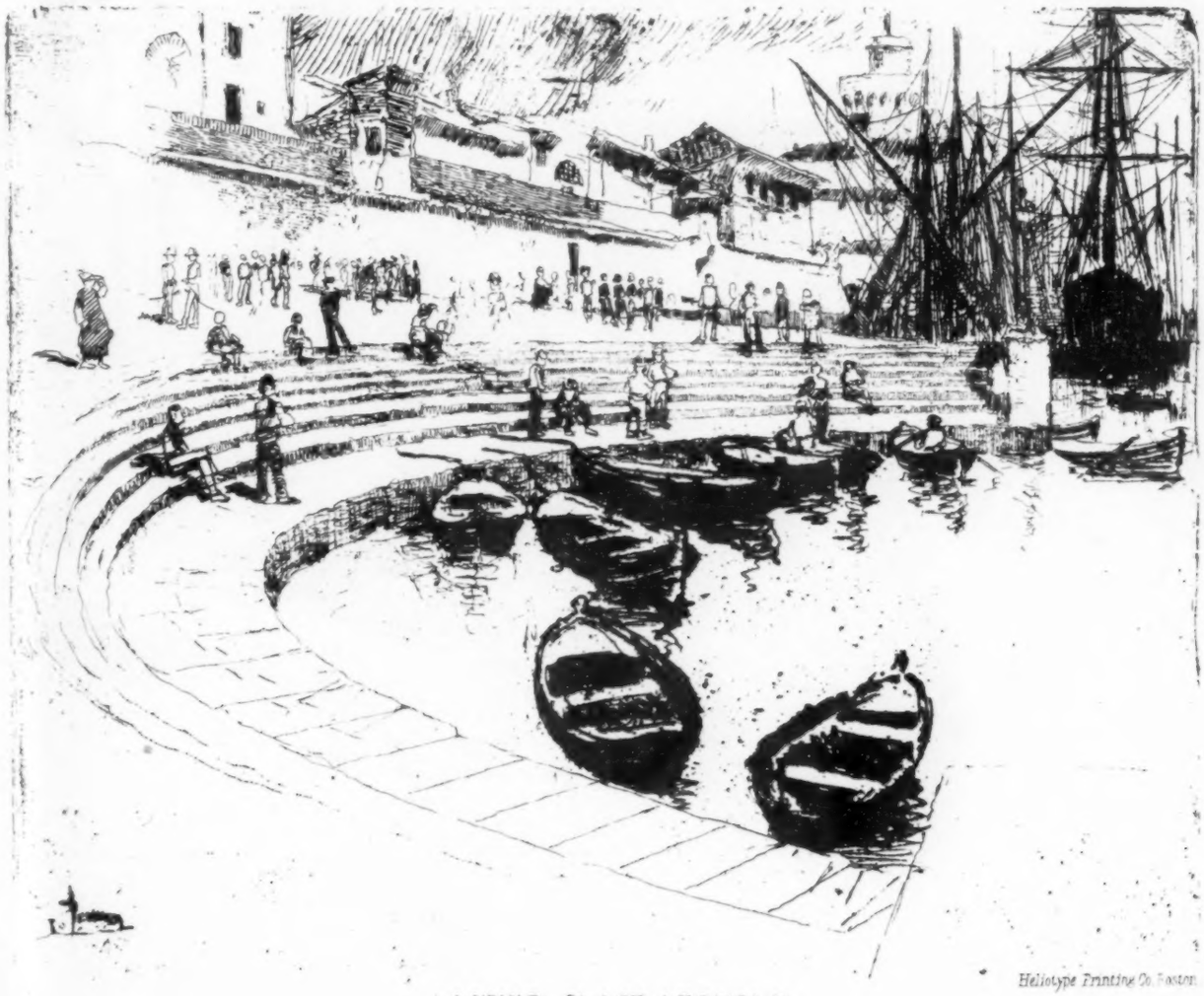
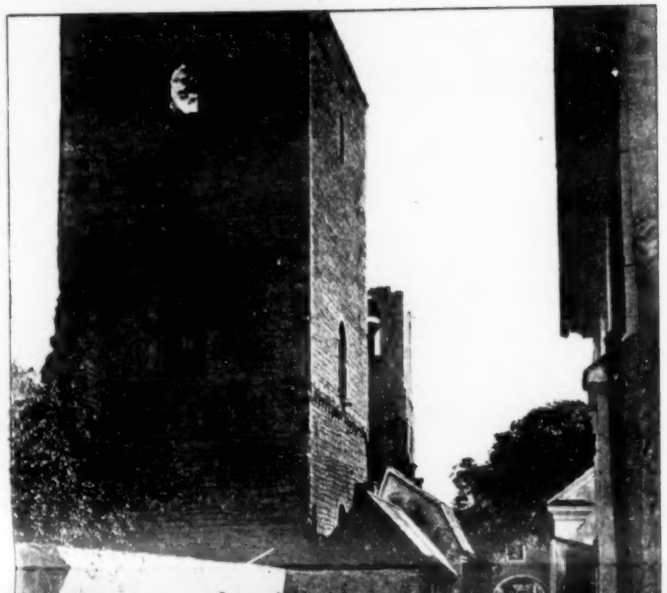
AN ALLEYWAY, PHILADELPHIA.



LANDING PLACE, LEGHORN.

Heliotype Printing Co. Boston.



VIEWS AT WISBY, ISLAND OF GOTLAND, SWEDEN

Heliotype Printing Co. Boston.

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Residence of Chas. F. Loudon,
Avondale, Ohio.

S. E. Des Jardins,
Architect.

Heliotype Printing Co. Boston

Pistoja, at Venice and other Italian cities, which complete the tale of his published plates, except one or two done for the *Portfolio*, in all about forty-five. Of late Mr. Pennell's time has been absorbed in illustrative work, but we shall hope to see some new etchings from his needle before long. The prime qualities of his etched work are freedom and beauty of line. His prints are full of vivacity and force, and as far as can be from the labored and conventional, and warrant us in placing their author with the foremost of our etchers — one of that brilliant group of young artists who are fast raising American etching to a place alongside of American wood-engraving. The high quality of Mr. Pennell's work was early recognized in England, where he was elected a member of the London Society of Painter-Etchers. He also belongs to the Philadelphia Society of Etchers and to the New York Etching Club.

Concerning the etchings which are here reproduced by the kind permission of Mr. Pennell and his publishers, Messrs. F. Keppel & Co., of New York, I should mention that the "Chancery Lane" is photographed from a "clean-wiped" proof.

Mr. Pennell's work as an illustrator — and it is of great extent — has been done mainly for the *Century* magazine and comprises what I suppose may be considered as his most serious and important undertaking thus far. I mean his illustrations to Mrs. Van Rensselaer's series of papers upon English cathedrals — Durham and Salisbury and the rest of those rich architectural jewels in the churchly crown of Albion — and I think it would not be easy to say more in their praise than that here the artist is worthy of the author. The admirable style of one well accompanies and gives the last touch to the work of the other. The drawings, which are deserving of the closest attention and which show that Mr. Pennell handles brush or pen with equal facility and success, have detained the artist in England for several years. One of the chief charms in his illustrations is their unfailing picturesqueness. This everybody can see, but not all will appreciate the admirable use of the pen in the line-drawings, which make up by far the greater part of his work, or notice how very few strokes are wasted or uncalled for. At times it almost seems as if more could have been used with better effect, but a second inspection will show this to be doubtful and every line added would tend to weaken their fascinating suggestiveness. Mr. Pennell always has a firm hold of the character and spirit of the subject he draws and others may render it more elaborately (often a difficult task) if they will. He has distilled into printer's ink the essences of many places — gloomy monasteries of the Order of the Solitary in Pennsylvania, those strange reminders of one of the most curious of the many faiths that have found a footing in this wonderful country of ours; old taverns and tumbledown-houses, crumbling away from age and the march of improvement, which shamefacedly huddle together in some of the back streets of the city of William Penn; ancient New Orleans with its reminiscences of the rule of Bienville, its Place D'Armes and Cathedral and its Creole houses; Tuscan and other Italian cities — "fair Florence," "pitiless Pisa," "industrious Lucca," Siena, Pistoja, Prato and Fiesole, ducal Urbino, fierce Rimini, Venice and Rome; the Four Courts and Sackville Street, St. Patrick's Cathedral and the Phœnix Park of Dublin on the Liffey, and the "reverend walls" and "college fanes" of Oxford

> "Massy piles of old munificence
> At once the pride of learning and defence";

the smoke and grime of many-chimneyed Sheffield, and the bridges, the towns, the châteaux and the island of the Saône. His latest published work in illustration is a number of drawings of London, which embellish even the brilliant text of Henry James. Mr. Pennell has been fortunate, indeed, in being chosen to illustrate the travel-essays of writers like James, Howells, Cable, Hamerton and Vernon Lee.

One of the earliest papers in the *Century*, for which he furnished drawings was "A Ramble in Old Philadelphia" written by Miss Elizabeth Robins, a niece of Charles G. Leland. The artist had accompanied the author and her uncle in their walk and since the lady became Mrs. Pennell they have travelled many long miles together. Mrs. Elizabeth Robins Pennell is now well-known as a writer, especially in the magazines, and has written a life of "Mary Wollstonecraft" for the Famous Women series. Both she and her husband have made tricycle tours on the Continent, and French and Italian peasants have stopped their work in the fields at the sight of a lady sitting on a "sociable" in front of a rather tall gentleman in a Scotch cap "coasting" merrily down hill or wearily climbing another in the rain. As Mr. Charles G. Leland says in his amusing rhymed apology which prefaces the "*Two Pilgrims Progress*:"

> "He who with her a Pilgriming did go, —
> That was her Husband. As this Book doth show,
> Rare skill he had when he would Sketches take,
> And from these Sketches pritte Pictures make."

That tricycling, like life, is full of ups and downs and yet has its fair and level spaces, is shown in the charming little records of these trips which, written by Mrs. Pennell and illustrated by her worser-half, have been published within the last few years. The names of these bright and dainty little books — I hope we shall see many more such — are "*A Canterbury Pilgrimage*," "*Two Pilgrims Progress*" (from Florence to Rome), and "*Our Sentimental Journey through France and Italy*." The first recalls Chaucer, the second Bunyan, the third Sterne and the last joint-work of this clever pair reminds us of Dr. Johnson. It is a sketch of a (walking) tour to the Hebrides and contains some of Mr. Pennell's best drawings. But no need to say more of it as every one has enjoyed it in the pages of *Harper's*. William Black, though he has shown disapprobation of some opinions expressed in the Hebridean series, does not withhold praise of Mr. Pennell's drawings of the places so closely identified with his stories.

A happy fancy it was that associated these pleasant journeyings with those of other famous travellers (not all of whom, however, voyaged in the flesh) and shows us Oban and Iona, Calais, Montreuil and Nampont, and the gray old Cathedral town as they are in this decade, and not as they were in the days of Boswell, of Dessein's Hotel and Yorick's grisette, and of the gentle "nonne" and the "younge squire."

WALTER ROWLANDS.

MEDIÆVAL HOUSES.[1] — VIII.

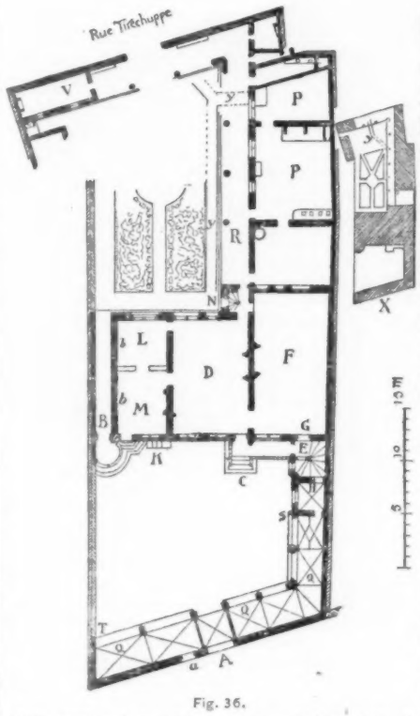

Fig. 36.

ONE of the most charming hotels of the latter days of the fifteenth century, which was so rich in buildings of this class, was La Trémoille, which still stood in 1840 in the Rue des Bourdonnais. This was a regular fief, created at Paris under Charles VI, and proceeding directly from the King — later, from the Bishop. It was rebuilt as we see it about 1490, by Louis de la Trémoille, who was born in 1460. It was this Louis de la Trémoille who captured the Duke of Orleans at the battle of Saint-Aubin-du-Cormier in 1488, which did not prevent the Valois, become king of France, from conferring upon him the command of the army of the Milanais in 1500. He was killed at the battle of Pavia.

Figure 36 is the ground-floor plan of this hotel. The entrance-door, *A*, and the postern, *a*, opened on the Rue des Bourdonnais, and gave entrance into a spacious court. From the entrance, a portico led to the buildings. To the left, under a tower carried on two columns, was a passageway, *B*, putting the court into communication with a garden which extended back to the Rue Tirechappe, and had a common gate on the left, and one on the right for equipages and horses. A broad stair, *C*, led to the grand *salon*, *D*, into the principal staircase, *E*, into the *salon F*, by the door, *G*, and into the little arched room, *H*, by the descent of a few steps. Underneath were the well-arched and spacious cellars. Another door, *I*, with stairs and a horse-block, *K*, gave direct entrance from the court into the two rooms, *M* and *L*. A second staircase, *N*, ascended to the upper stories and the roof. At *O* was a little court with wells. The kitchens and their adjuncts were at *P*. They were in great part destroyed and enclosed in a neighboring property. A portico, *R*, extends to the entrance portico on the Rue Tirechappe, giving also a covered way from the kitchen and servants' quarters to the principal apartments and, by crossing a lower landing of the common staircase, to the dining-hall, *D*. The *conciergerie* was placed on the Rue Tirechappe at *V*. At *Y* a well-constructed sewer was found, which formerly collected and carried rain-water under the street. In the first story, the arrangement of the large apartments was the same as that of the ground-floor; the partition wall *b*, was, however, left out, thus enlarging the rooms *L* and *M*, of which the latter opened into an oratory or study in the tower.

The portico *A*, extending on the first floor between the points *S* and *T*, was well lighted on the court, but had only three small windows on the street. The large single apartment between the court and the garden on the second floor was reached by the two

[1] Translated from the French of Viollet-le-Duc, by Mr. A. B. Bibb. Continued from page 271, No. 676.

staircases *E* and *N*. The kitchen-buildings, servants' quarters, and the portico *R* were not carried above the ground-floor. At *X* is a general view of the Hôtel Trémoille, with the garden and the servants' offices and quarters. The architecture of this hôtel was one of the most beautiful creations of the latter part of the fifteenth century. The left tower, the great staircase, and the porticos, with their upper story, had suffered very slight mutilations. The front

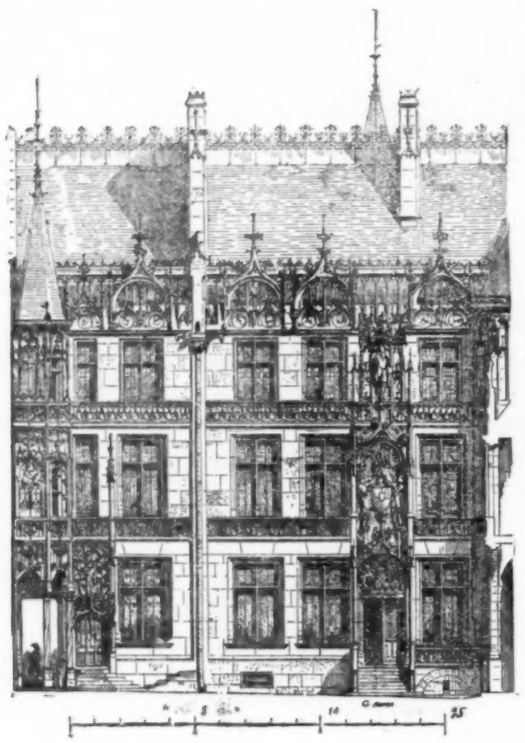

Fig. 37.

of the apartments on the court had been much damaged, but the principal decorations were preserved in fragments under the modern plastering. On the garden side the front was very simple. The most admirable thing about this charming bit of architecture was the delicate taste of the artist. The mingling of plain and decorated surfaces was most happy. The hôtel was demolished in 1840. Conjointly with the Historical Monument Commission, I made at the time the most pressing appeals for the preservation of this masterpiece. We gained, however, only the privilege of carrying off several fragments to the Ecole des Beaux-Arts, where they are still to be seen, set in the wall on the left of the entrance. At Figure 37 is the façade of the great rooms between the tower and the staircase.

All the world knows the Hôtel de Cluny, which is built over the thermal baths of Julian, and contains to-day the Museum of Mediæval Relics. This edifice is of the same epoch as the Hôtel de la Trémoille, and shows a similar arrangement. On the Rue des Mathurin rises a plain battlemented wall, and the buildings are between the court and the garden. We quote from the Baron Guilhermy this summary of the history of Hôtel Cluny: "In the first half of the fourteenth century, about 1340, Pierre de Chaslus, Abbé of Cluny, bought the site of the Palais des Thermes, with the intention of building a dwelling near the college of his abbey, opposite the Sorbonne. This project does not seem to have been carried out, and it was not until the end of the fifteenth century that Jean de Bourbon, one of the successors of Pierre de Chaslus, began the construction of the edifice, which still exists. When this prelate died, the foundations were hardly above the earth. Jacques D'Amboise, who united at the same time the titles of Bishop of Clermont, Abbé of Cluny, Abbé of Jumiéges and Abbé of Saint-Alyre, restored in 1490 the work of his predecessor, and conducted it to entire completion." More fortunate than the Hôtel de la Trémoille, the Hôtel Cluny was preserved, thanks to the collection which Dusommerard placed there, and to the reputation which this collection of mediæval objects soon acquired throughout Europe. In 1842, the Government bought the hôtel and the collection which it contained, and ceded it, with the rest of the Baths of Julian, to the city of Paris, and to-day the Museum is the Mecca of the mediævalist.

At Figure 38 is the ground-floor plan of this hôtel. The apartments are larger than those of the Hôtel de la Trémoille, but the garden is not so extensive. At *A* is the principal door on the Rue Mathurin-Saint-Jacques, with its postern, *A'*. The porter's lodge is at *B*; farther on is a portico, *C*, which gives entrance into the rooms, *H*,

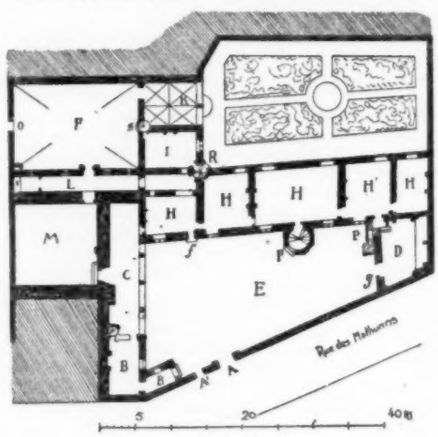

Fig. 38.

on the ground-floor, rooms into which there are also entrances by the large staircase, *F*, and by the little door, *f*. The kitchen is at *D*, with its front steps and its private staircase, *P*, leading to the floor of the kitchen and into the *salle*, *H'*. A door, *g*, gives direct entrance from the court into this kitchen. At *I* is a room overlooking the garden, with a staircase in the angle *R*, having a door into the room, *I*, and into the passage, *L*. At *K* is an open room, a sort of covered yard under the chapel, which is on the first story. *F* is a court, with an entrance, *O*, into one of the rooms of the ancient baths. *M* is also an ancient hall, in which were probably the stables. The gallery *L* formerly communicated with the latrines. The wall on the street is battlemented, and had a wooden patrol-walk carried on corbellings, which have been destroyed and replaced by iron props. A little staircase, *S*, leads down from the *salon*, *I*, into the covered yard, *K*, and up direct to the chapel. The garden, *G*, 17 metres wide by 35 metres long, was bounded by private properties. The principal staircase, *F*, ends upon a platform which is reached by a small spiral staircase coming from the story under the roof.

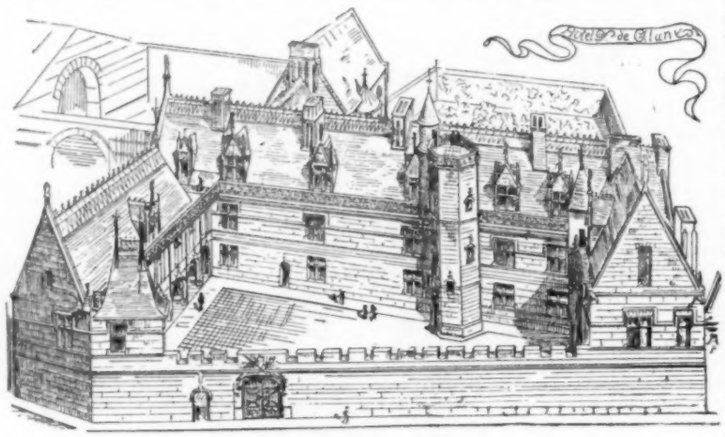

Fig. 39.

The Hôtel Cluny, like the Hôtel Trémoille, had cellars, a ground-floor, a first story, and a story under the mansard roof. These buildings are very well preserved. The ancient floors, formed of beams supporting the joists, are still in use, and several of the chimneys date from the first construction.

While the architecture of the hotel has not the elegant delicacy of La Trémoille, it lacks neither grace nor style. The windows are happily placed, the staircases well planned, and the chapel is a little *chef-d'œuvre*. It has an "*absidiole*" carried on corbelling beyond the outer piers of the covered yard. Like this yard, it is arched, and its four pointed arches are carried on one central column. Figure 39 gives a bird's-eye view of this hôtel taken from the entrance side.

There still exists at Paris a hôtel of the end of the fifteenth century, the Hôtel of Sens, which was the residence of the Archbishop of Sens when he sojourned in Paris. (The Bishop of Paris was, until the seventeenth century, subject to the Archbishop of Sens.) This hôtel is built on the public place formed by the intersection of

the streets, Hôtel-de-Ville, Fignier, L'Etoile, Barrés and Fauconnier. It was built by the Archbishop Tristan de Salazar, between 1475 and 1519. The numerous mutilations which it has suffered have almost entirely obliterated its original character.

There are still to be seen pretty hôtels of the Renaissance and of the beginning of the seventeenth century in several provincial towns. The Hôtel Pincé, at Angers, is a charming edifice of the sixteenth century; that of Vauxluisant, at Troyes, which dates from the first years of the seventeenth century, is remarkable for its plan and the happy outlines of its buildings. At Toulouse there are still a number of hôtels of the sixteenth century.

The work of Ducerceau ("*Les Maisons des Villes*") gives numerous examples of good plans and buildings of excellent taste. While the houses of the seventeenth century were only common lodgings, in which it is difficult to find a trace of art, such is not the case with the hôtels.

Under the reigns of Henry IV, Louis XIII, Louis XIV and Louis XV, in Paris, Lyons, Toulouse, Bordeaux, Caen, and Nantes a number of beautiful hôtels were built, which still preserve the arrangements of the dwellings of the nobles and rich merchants of the Middle Ages and the Renaissance. The Hôtels Lambert, Carnavalet Mazarin, the Imperial Library, Pimodan and Soubise (the Archives of the Empire) are models of grandeur and of good taste which put to shame all that we have done in this style in our day, so much easier is it to acquire wealth than to develop the sentiments of dignity and good taste.

[To be continued.]

THE PRESENT ASPECT OF LAND-DRAINAGE.[1] — II.

THE ENGINEERING OF UNDERDRAINAGE.

THE best work is, perhaps, that which is based on the general principle, which holds good in ordinary soils, that drains four feet deep may be forty feet apart. In very heavy soils, they should be at less intervals, in lighter soils they may be at wider intervals, if deeper they may be farther apart, and if shallower they must be nearer together. The range according to quality of soil would be perhaps — for after all there is no fixed rule — for three-foot drains, intervals from fifteen feet to thirty feet; four-feet drains, from thirty feet to sixty feet; and five-foot drains, from forty feet to one hundred feet. It is sometimes wise to construct the drains at double intervals. For example, if the ground is rather light than heavy, four-foot drains may be laid at intervals of eighty feet with a view to the future construction of intermediate drains, reducing the intervals to forty feet, should the first prove in time to be insufficient. Concerning this, as with other details of the work and with all work that cannot be based on fixed rules, the experience and judgment of the engineer are of the greatest importance, especially in securing a good result without excessive cost. It is not fair to a client to make him pay for fifty per cent more work than is necessary for the sake of securing one's reputation absolutely against failure. This is true everywhere, and it is especially true in underdrainage where intermediate drains may be introduced subsequently without the loss of work already done.

Underdrainage as ordinarily carried on may be divided into two classes:

(1) Thorough drainage, where the object is to give a free and prompt discharge to rain-water falling on the surface and percolating through the soil.

(2) The removal of spring and seepage water due to sources outside of the area to be drained.

In the first case, the drains should be laid as nearly parallel as the conformation of the ground will allow, and as nearly as practical at right angles to the contour lines of the land. It was long considered best, and it is even yet not entirely obsolete, to lay underdrains diagonally along the slope of the land, with a view to catching the flow from above. This is not the way to secure the best effect from the work, as will be understood if we will consider the ground to be drained in small sections, say a yard wide, running along the hill at right angles to the slope. For a short section like this, the slope is of no account. It may be treated as level land. As level land, it is most economically drained by crossing it at intervals of forty feet (more or less) by lines of drain-tile. The next yard in width above it, and the next yard in width below it are similarly situated, and they may best be drained by continuing the same tiles across them, and so on for the whole hillside.

If we run a drain across a slope, it will have a good effect for a certain distance above it, but the land below it soon becomes too low to drain toward it, and nearly the whole interval between the parallel lines must send its water to the drain at its lower side.

In the second case, where the object is to intercept extraneous water, it is much the most effective plan to carry drains across the slope in such a manner as to cut off seepage from land beyond. Usually, one such drain at the upper edge of the tract, to act as a header, is all that is required for this work. The extraneous land being cut off, the land below the header, if to be drained at all, may best be drained by the perpendicular system. To get the full effect desired from the header drain, it is often necessary to go deeper than the level, at which it is proposed to lay the tile by which the water is to be carried off, filling the ditch below with stones or gravel, allowing the water to rise from the intercepted stream to the line of exit. If the ditch crosses a rather free seam of water, the lower side of it should be well puddled with clay to cause the flow to rise to the line of the tile. If the tile can be laid at the bottom of the porous stratum, this, of course, is not necessary. If the purpose is to drain away water which now appears at the surface in the form of springs, the proper plan is not to try to circumvent the spring and cut off its source beyond, but to drive straight into it and through it at a depth which will withdrawn all of its water to a sufficient depth to be out of the way.

Draining-tiles have been made of various forms. The oldest, and the least desirable, is the horse-shoe tile which was made before the introduction of the tile-machine by moulding a flat cake of clay over a former, and which being largely in use, because originally the only tile available, continued to be made after the introduction of machines. This tile is not to be recommended for use under any circumstances.

The next step was to make what is called the sole-tile, being a round or egg-shaped pipe with a flat bottom, sometimes also with a flat top, so that it might be laid either side up. These are used considerably, but they are objectionable because of the difficulty of protecting their joints properly, and because of their liability to warp out of shape. The best for all uses, especially with the smaller sizes, are the round tiles which are now chiefly made. They can be laid on any side, so that if warped they will still have a true flow line. Their joints may be protected by encircling collars, or, better still, by a wrapping of muslin which will last, at least, until the earth is perfectly compacted around them, and is no longer likely to enter them.

The Size of Tiles. — There is no special reason, save for the question of cost, for using tiles smaller than two inches in diameter, but the difference in first cost is considerable, and if transporation is an important item, it would be better to use one-and-one-half, or even one-and-one-fourth inch tiles. The latter size, if properly laid and if jointed securely together at its ends, will give ample outlet to the drainage of an acre of land. The calculation is usually made according to lengths. When tiles are placed forty feet apart, one-and-one-fourth inches is ample for the removal of the water that will be received by a drain one thousand feet long. In nearly all cases, it would suffice for twice this length, or for two acres, but in view of the irregularity of form and the necessary construction of the channel at the joints where two tiles of irregular form come together, it is better to adhere to the former limit. If the tiles are well laid, the larger sizes will furnish a sufficient outlet for the areas given in the following table:

1¼	inch	tile,	2 acres.
2	"	"	5 "
2½	"	"	8 "
3	"	"	15 "
4	"	"	30 "
5	"	"	40 "
6	"	"	50 "
8	"	(or two 6 inch)	100 acres.

It is not pretended that these drains will immediately remove all the water of the heaviest storms, but they will always remove it fast enough for all practical purposes, and, if the pipes are securely laid, the drains will only be benefited by the occasional cleansing they will receive when running "more than full."

Obstructions. — If tile-drains are properly laid, properly jointed and properly covered, they are not likely to become obstructed (unless in exceptional cases by soil) by any other accident than the intrusion of the roots of water-loving trees. If the tiles are covered by, or imbedded in, porous material with the mistaken idea that this will cause them to receive water more freely, they are always in danger of having dirt washed into them by runnels of water through the loose filling. *They should be closely packed in the firmest earth that is taken out of the ditch*, every precaution being taken to prevent water from entering them in any way but by its gradual rising from below. However careful you may be, a drain that carries water at any time when the ground about it is dry, will be quite sure to be entered by the roots of elms, willows and similar trees, standing even at a considerable distance. There is, apparently, no remedy for this, short of the destruction of the trees. We have to take our choice between losing the trees and running the risk of a frequent need for taking up the tile to free it from roots. Gisborne, one of the best writers on land-drainage, says:

"My own experience as to roots, in connection with deep pipe-draining, is as follows: I have never known roots to obstruct a pipe through which there was not a perennial stream. The flow of water in summer and early autumn appears to furnish the attraction. I have never discovered that the roots of any esculent vegetable have obstructed a pipe. The trees which, by my own personal observation, I have found to be most dangerous, have been red willow, black Italian poplar, alder, ash and broad-leaved elm. I have many alders in close contiguity with important drains, and, though I have never convicted one, I cannot doubt that they are dangerous. Oak and black and white thorns, I have not detected, nor do I suspect

[1] Continued from No. 675, page 255.

them. The guilty trees have, in every instance, been young and free-growing; I have never convicted an adult."

G. E. Waring, Jr.

ARCHITECTURAL EVOLUTION.—I.

INTRODUCTORY.

Curious old Stove. Dudswell. Que. This Stove passes under the partition and heats two Apartments, being fed from other side.

THE world is in a continual state of evolution. There is nothing so near "perpetual motion" as the development of the human race. A few centuries have changed a nomadic tribe, into a stay-at-home, civilized community and that community has gone on developing internally and externally until it has become a nation. It is impossible to separate a man from his surroundings and if we would write a biography, we see at once how great a part in the formation of a man's character his surroundings have had and how far more he is influenced by his surroundings than they by him.

A man is not developed without his mind. Natural instinct sets the mind to work and thus a man learns by the integral parts of his own being how to supply his wants. And as a man developes so does a tribe, a nation. Civilization is evolved from savagery. Instinct acts on the mind, and the mind on the body,—the intellectural upon the muscular,—the educated upon the ignorant. Instinct shows the savage the advantage of a sheltering roof, mind suggests to him a method of constructing it. Instinct makes him cover his nakedness, mind shows him how to paint his body or put on skins, and in each case the body, enlightened through the mind, sets to work to accomplish the end. There are three kinds of beings in a tribe who may be compared severally to instinct and mind and the body or muscular part. There are those who see a necessity; those who show how that necessity may be relieved, and those who by animal strength carry out the work. The first and second may be one, so nearly are the instinct and mind allied. By instinct the savage counts, by the score—twenty—the number of his toes, fingers and thumbs: the mind teaches him to make twenty marks and to put twenty other marks by the side of the first twenty, and so on he counts and comprehends the expression of numbers. Further enlightenment makes him put a cluster of marks or lines, together, to denote particular quantities and thus is evolved our 1 2 3 I = ≡

So with the covering of the body, a cincture becomes an apron, the apron a skirt, which lengthened upwards and downwards becomes a vest and from the vest arises every garment. From the texture of clothing, a great part of the ornamentation of a building is derived, patterns of the stuff having suggested forms for decoration.

The progress is slow, but development may be traced inch by inch. A tree trunk becomes a post, a pillar, a screen, a wall, of wood, stone, brick or iron; a bough becomes a lintel, an arch, a roof and so from the tangled bough of the wilderness are evolved our palaces and cathedrals.

But the theory of architectural evolution does not exclude Divine intervention, indeed there would be no such thing as progress, without superhuman interference. Instinct would have been as a dead thing and never have suggested to the savage the necessity of a roof over his head or a covering to his body. Mind would have been a blank, in fact, instinct and mind or, to speak of them as one, *soul* would never have existed at all without God; for soul, spirit, life itself is direct creation and never was evolved.

Evolutionists, who like to believe that their species had its origin in a bit of matter like an oyster, cannot tell us how, when, or where protoplasm first started on the journey of improvement. They only say it *did* start. But that cannot be satisfactory to themselves and certainly will not satisfy the inquiring public, and therefore the inquiring public has to fall back upon the idea, with which it was brought up, that there was a "something" more intellectual than the oyster to start with whose origin none can by any possibility trace, and they, happily for themselves, have to be content with the simple dictum "In the beginning . . . God created man." And created man into whose body was infused a soul and who has by this vehicle of Divine guidance been taught to make use of everything in this world, has also been taught, by an innate sense of the beautiful, that through his instrumentality that beauty of form and color which "is the expression of the mind of God seen through a material medium" may be developed and perfected. The soul of man puts life into material; dead walls may live through effective coloring—solid stone through carving. A whole building may be alive though in repose, through the true proportions of its component parts.

And now having glanced at man's origin and noted that he has in him a "spark" not of himself and that owing to that spark he is capable of improvement himself and of improving his surroundings, I will take him as I find him 4,000 years before Christ and see how the art and science of architecture was developed through his means.

EVOLUTION OF THE EARLIEST FORMS OF ART BUILDINGS.

To study the subject thoroughly we must start with the early history of the art and I shall here quote from a former paper of mine treating on that subject: The very earliest structures that have any claim to the term "Art" are discovered in Egypt and date as far back at 3900 B. C. It was then that the people first conceived the idea of erecting for their chiefs and rulers indestructible edifices, wherein the embalmed bodies might repose undecaying in security and peace, until they should again be called into life, as their traditions led them to believe would ultimately be the case. We may contemplate with amazement the great monumental excavations, elaborately decorated with hieroglyphics by which each chief sought to hand down to eternity the record of his good deeds; and as time proceeds we find in place of rock-cut tombs, enormous temples and pyramids and lofty obelisks and in each is seen an ever increasing development of what may truly be called the "the germ of art." But how and whence did the Egyptians get their ideas of these forms for their buildings. It is not necessary to go back 6000 or 7000 years from to-day and to go to Egypt to learn this, we have examples of it in every country, "prehistoric remains" which we can see for ourselves.

From living in holes and caves in the rocks, some of the people would stray to the flat country, perhaps in search of food and water; and here they dug holes in the ground and covered them over with branches of trees, and so formed themselves a secure retreat. Remains of this kind I have seen in England, and the excavations, circular on plan, would average about nine feet diameter at the surface of the ground and, sloping downwards four feet, would leave but a small level place at the bottom. We can then imagine them desiring greater height and raising the covering for easier access and greater convenience when inside. The next development would be the erection on the ground, without excavation, of a tent-like arrangement of branches covering an area sufficient to shelter a man and his family, and here is the origin of the pyramid. Then would follow the suggestion of raising the tent, propping it up on posts so as to form a roof, putting the posts so close together that they would form a protecting wall all round; and then the wooden posts would give place to stone walls, and, strange to say, the stone walls of such dwellings, sometimes a couple of feet out of ground, are found standing even now.

Every tribe would have its chief or leader, perhaps the head of the family, and a single post, bough, or trunk of a tree shorn of its branches would be stuck up on end to mark the chief's hut. This custom of setting up a post or a rock to mark particular sites or events has come down to us from time immemorial, and gave rise to the Egyptian obelisk. From the circular form of habitation, the square and the oblong would soon be reached; increase of width in the oblong necessitated additional support to the roof inside, and, by the introduction of posts to meet this necessity, we have the origin of pillars.

Because of the inborn desire for ornamentation, the rude pillars were gradually shaped; and the common objects around, such as foliage, flowers, stalks, fibres and shoots of plants, the texture of drapery, and even the curling shavings of wood, gave suggestions for decorative treatment.

Neither were they satisfied with mere form. As color existed in natural objects, so must it be part and parcel in the representations of them; the exaggeration of tone in the colors used in the well-meant attempt to copy the harmonious effect of colors in nature can be easily explained—for the art of coloring required as much developing as did architecture. But in the use and application of the forms they adopted for decoration, a very striking instance of their comprehension of the fitness of certain forms for particular positions is to be seen. The top of the pillar, slowly developed into a capital and later made a separate and distinct feature, upon which the weight of the superstructure came direct, was ornamented in an upward direction, thereby signifying resistance to the downward pressure; and in the base or foot, when this feature was developed, this ornamentation was reversed as the weight of the pillar was distributed by means of its foot over the foundation below; or again, the pillar would be ornamented at its head and foot, where no base existed, leaving the greater part of the length of the shaft plain, thus emphasizing the strength of the pillar to resistance where it comes in direct contact with the object it supports or that which supports it, leaving to the rest of the shaft the simple dignity of its own outline; and the form this ornamentation of the lower part of the shaft took was a cluster of foliage, as if the shaft rose out of the ground with the plants growing round it.

A post supporting a horizontal piece of wood with considerable weight upon it is apt to crush into the fibres of the lintel; to obviate this a short piece of wood would naturally be inserted, of the width of the top of the post, to preserve the lintel and distribute the pressure of the post. The diameter of the capital generally exceeded the width of the entablature to be supported; if it did not it looked weak, and, indeed, was so, although at the neck of the column the diameter was often less than the width of the beam, and in order that the weight should be borne by every part of the capital equally, the short piece was widened till it covered the top of the capital, thinned and made a square, instead of an oblong. The heads of the columns became very elaborate, as the wood was easy to work and carve, and when the attempt was made to use stone

instead of wood, these forms were wrought in stone with considerable trouble and with ultimate success. From copying inanimate Nature as ornament, a rise to a higher type of art is to be noticed in the painting of the head of the deity "Isis" on the faces of the square-headed pillars, with its attributes. Painting led to carving in relief, and we soon find animals introduced into the ornamental parts of the architecture boldly carved. The Persians took up the idea, and put horses' heads and shoulders, two and two back-to-back, on the summit of their columns, but the highest art was not attained until the attempt was made to reproduce human figures in relief.

The grotesque is always easier to accomplish than a real imitation or copy, and, as the human figure is the most beautiful of created things, it is also the hardest to copy. For centuries the huge, silent watchers of tombs had sat carved out of the solid rock, grim and stolid, rough in design and execution, towering above the heads of the human visitor. The gods of Egypt were represented more than life-size over and over again, and so were the heads of many of the Pharaohs, which were handed down for generations carved in marble. But it was a long time before any attempt was made to copy the human figure, life-size. It is the Greeks to whom we are indebted for sculpture and for a more truly artistic treatment of color-decoration, for to the Doric order these sister arts eminently belong. The pediments of the temples were enriched by groups of statuary, and the faint indications of what at one time must have been very rich coloring are still to be seen on the ruins. Human figures cut in stone and marble are soon to be seen taking the place of pillars as a highly decorative substitute. But I have not yet done with the original pillars. The well-known reeded shafts of Egypt, copied conventionally from a bundle of plant-stalks, are the forerunners of all shafts treated decoratively, and from the convexity of the reed-stalks is derived the reverse; namely, the concavity of the flutes. From the flutings of the classic shafts are evolved all moulded and clustered columns. The fillets attenuated and the flutes deepened, the fillets widened and the hollows narrowed, till at last the fillet becomes a separate shaft with its cap and base, the back of the recess or hollow becomes the outer edge of an inner central shaft, and the sides are merged into the new fillet-shaft. The column passed through many stages. The Romans took it and set it upon a pedestal, and even made it do duty as a monument, standing alone, as did the obelisks of Egypt. But when they thus set it up on a pedestal they fell into a great error, for they acted contrarily to the spirit of the art. Not content with the honest beauty (than which there is no greater beauty) of ornamental construction, they began to construct their ornament. They made the pillar a useless adjunct; clapped onto the face of the real work, they made it do an imaginary duty of giving support to a heavy cornice, which, in reality, was supported by an arch and piers behind. This was the Roman order, but it was not true architecture. The Goths understood this, and took the pillar down from its pedestal and put it to its proper use.

The caps of the columns deserve our attention now. The last-mentioned were the horse-top caps of Persia. These are particularly interesting because they mark distinctly the change from wood to stone architecture, and are probably the first executed in stone. They are not suitable for stone caps, as the detail is so thoroughly characteristic of wood-work. The ornamentation is very peculiar; the projecting scrolls on all four sides would seem to have no meaning in them; but, I think, they point to the wooden origin, and that this curious form is nothing more nor less than the curling ends of shavings of wood not completely cut off — for it is exactly the appearance of a whittled stick. Scrolls play an important part in the history of all capitals, and the beauty and simplicity of the device at once commends itself to the imagination. It might have been supposed that the Greeks would have introduced these into the caps of their first order, as they appear to have admired them so much and were at such great pains to adopt them successfully in the Ionic order. But, the fact is, that the Greeks obtained every one of their ideas direct from Egypt in the first place, and their Doric columns are simply copies of pillars erected in Egypt centuries before the Greeks ever saw them. The Greeks improved them, but, that these forms had their origin in the supposed peculiarly fertile minds of these ingenious people, I suppose no one really believes nowadays. When they saw the scrolls, they tried valiantly to make use of them, and in their earnest attempts produced some of the most ungainly caps one could well wish to see. The scrolls would not fit the four sides of a square cap alike, so with the scrolls on two faces and the *ends* of the scrolls on the other two the corner columns of a temple would present a different appearance from any of the others. They were determined to have the scroll, and a bold and ingenious expedient was resorted to; they put scrolls or volutes on the two outer faces of the corner caps, letting them run against each other and project beyond the faces of the caps at an angle, thus giving to four caps each a single projecting corner. But this was so evidently a makeshift that it was soon abandoned, although their struggles with it were not to be wasted.

The ultimate result of it all was, the Corinthian cap with its four similar faces and four projecting corners at the top, each composed of two scrolls, so arranged that wherever placed, each side would present the same appearance. It was the Romans who perfected this order, and Romanesque architects were very fond of the volute, but in Gothic architecture it is by no means so prominent a feature, although, as a favorite form, it is constantly introduced in stone and color.

In the bases of columns there is not so much to demand our attention. They had the specific object of distributing the weight of the shaft and its burden upon its foundation, but, being below the eye line much decoration was inadmissible, and being so low down on the floor any ornamentation would have been in danger of damage. For pillars in the open-air, carving or deep recesses, besides being easily damaged, would have been but rain-holders and of no practical use. The simplest form of base was, naturally, a square block; the circular shaft coming down upon it, left large, useless and awkward spaces at the angles: imagine these rounded off at the corners and the upper part of the block so treated, cut off from the rest of the block and used as a distinct base rounded to follow the circumference of the shaft; and, then, by slightly undercutting this new member, we have the torus which is common to bases of all ages, since it was introduced.

R. W. GAMBIER-BOUSFIELD.

(To be continued.)

SOCIETIES

PHILADELPHIA CHAPTER A. I. A. TRAVELLING-SCHOLARSHIP.

IN the second competition for the Travelling-scholarship of Fifty Dollars for the best design submitted by any junior member of the Philadelphia Chapter of the American Institute of Architects, the award was made to Mr. Howard Spruance. The programme of the competition was as follows: Subject, a City House Front sixteen feet wide, style Flemish, drawings required — elevation and section, one-fourth in scale. Paper, bristol-board 18″ x 28″. Rendering to be optional. Almost half of the drawings were barred from competition by the fact that they were not in the style called for by the programme. The committee were Frank Miles Day, Lindley Johnson and T. Roney Williamson, architects.

NOTES AND CLIPPINGS

CHINESE GRAVEYARDS. — But as soon as China was reached, the silent cities of the dead came again to the fore, with greater prominence than ever. One stands on the walls of Canton near the Five-storied Pagoda, and sees the hills to the north all covered with graves. It is the same near any Chinese city. The living occupy the city and the level ground, the dead the hills. No corpse is allowed to be buried within the walls of a Chinese city, and without, the vast cemeteries cover the hills with no fence or other limitation about them. The Chinese family which can afford it, builds a "horse-shoe grave," or bricked vault on the hillside with the end built up in the horse-shoe form. Poorer people stick their dead in shallow graves on which a small tablet of wood or stone is put. In some districts of Quang-tung, near the headwaters of the Pe-Kiang River, the cemeteries consist of big jars set in niches of the rocky cliffs of the Mae-ling Mountains. As you pass along the foot-trails you see the steep rocks above thickly studded with these big earthen jars, in each of which is a human body in a sitting position. In the rich alluvial plains, where no uncultivable hills are available for burying the dead, a graveyard resembles very much a white ant village in Africa. The graves are sugar-loaf mounds, thickly clustered together. While John Chinaman pays great respect to the dead, he takes care that they do not appropriate much ground that is of value to the living. The cemetery of a Chinese village among the rich rice-fields, covers very little ground in proportion to the number of graves. It seemed to me that bodies must have been placed one on top of another, or stood upright, so thick were the tapering mounds. The Chinese graveyard is, on the whole, a less disreputable-looking place than the Turkish or Persian; yet the horse-shoe vaults are sometimes seen in a very dilapidated condition. When passing through them I have frequently peeped in and seen the crumbling coffin and the skeleton. In some parts of China one seems to be travelling through cemeteries most of the time. Particularly is this the case in thickly populated districts, where the topography is undulating plain. The ridges, where the soil is thin, are then the cemeteries, and a rigid spirit of economy has relegated the alignment of the public roads thereto, rather than through the fields. In such a district the traveller is in the company of the dead all day long. Among some of the aborigines of China their cemetery is a bamboo grove. The dead, swathed in matting, are lashed in an upright position to the stems. Here they remain until the ravages of time, birds, insects, and the elements have reduced them to skeletons, when the bones are washed in hot water and buried. These people tie up the male bodies in one grave and the female in another. — *Thomas Stevens, in the New York Evening Post.*

THE WASHINGTON MONUMENT. — The November number of *Stone* says great care is taken to note the movements of the Washington monument, for it does move. The law of contraction and expansion of material by heat and cold operates here as elsewhere. When the sun shines full on the eastern face in the morning, the stones on that side expand and throw the shaft slightly to the west. Then the sun goes around to the south, and the apex of the monument makes a corresponding swing to the north. As the orb creeps about the sky to its final setting in the evening, the glittering point on the top of the monument makes a contra-movement around half a circle, gradually settling back to its normal position after the rays of the sun have lost their power. This movement has never been calculated, but is undoubtedly

very slight. The wind, too, has an effect upon the structure. From the centre of gravity of the shaft, located 174 feet and ten inches from the floor, is a cross-beam from which is suspended a fine steel wire, protected by a galvanized-iron tube about four inches in diameter. This hangs to the floor at the north-west corner of the elevator well. At the bottom is a plumb-bob weighing twenty-five pounds, suspended by means of the wire, and hanging in water. An iron cylinder protects the instrument from injury, and a little iron house four feet high keeps off the draught. Through the cylinder is a telescopic eye-piece, in one end of which are two vertical wires about one-quarter of an inch apart. When a candle is held at an opening in the side of the box and the eye is applied to the outside end of the tube, the plumb-line can be seen — a fine line between the vertical marks. Any movement in the shaft is recorded by a corresponding movement in the line. When the structure is at rest and in its normal position, the line hangs still, midway between the others; but when the shaft is disturbed by the action of the wind it sways back and forth like the pendulum of a clock, always coming to rest in the centre. This is observed every day, and if the custodian should ever notice the line hanging still at any point outside of the two cross lines he will then know that the monument has been permanently moved from its level position. Until then, however, no one need be alarmed by the oscillations of the shaft from the action of the wind or the influence of the sun. — *The Architect.*

THE EFFECT OF MOISTURE ON WOOD. — Dr. Hildebrand has carried on investigations into the action of moisture upon various kinds of wood, the results of which he publishes in Wildeman's "*Annalen der Physik und Chemie.*" We learn from the article on the subject, which is a lengthy one, that the author confined himself in his experiments to observing the extension of the longitudinal fibres of wood, leaving out of consideration the well-known phenomena of the swelling and the shrinkage of wood, which take place in a direction perpendicular to the longitudinal fibre. The author finds that, within certain limits, the length of wood in the direction of its fibre depends upon the amount of water present in its membranous tubes. Supposing a wood absorbs from twenty to thirty per cent of water (which is the range of the increase of weight dried under an air-pump), the increase of length varies between one-tenth and two per cent. The greatest length is attained when wood is kept in air saturated with steam, or when placed in water. The weight and length of wood increase with the relative moisture of the air, and diminish with the decrease of moisture. The kinds of wood named below, which were exposed to the natural variations of moisture in the air during summer, showed the following changes:

	Relative Moisture of the Air.		Variation in Length. Per cent.
Mahogany	0.814	0.570	0.057
Ebony	0.814	0.665	0.03
Fir	0.798	0.765	0.012
White Beech	0.814	0.570	0.05
Red Beech	0.814	0.570	0.043
Alder	0.814	0.665	0.047
Oak	0.798	0.584	0.062
Lime-tree wood	0.798	0.584	0.028
Maple	0.814	0.665	0.019
Pine	0.798	0.570	0.043
Poplar	0.814	0.570	0.069

The author says that great care should be exercised in selecting wood for measuring-rules. Mahogany and oak are entirely unsuited for rules, and the best woods to be used for the purpose are maple, fir, red beech, and lime-tree. He also states that the usual treatment of wood with polish, oil, or lacquer does not protect wood from the action of air saturated with steam. The best protection is afforded by lacquering, but the lac employed should be most carefully selected if the wood is intended for rules to be used for exact measurement. The author further adds that even ivory is not free from the action of moisture. — *The Builder.*

THE CROSS ON THE PANTHEON AT PARIS. — The Municipal Council of Paris has given orders for the removal of the iron cross on the Panthéon before the end of the year. To execute this order will be a very difficult task. A scaffold will have to be built around the dome, and this, with the cost of labor on the entire job, will entail an expense of $6,000. This cross, or rather the point where it is set, has had a checkered life. A cross was taken down in 1831 and in its place a colossal statue of "Fame," by Cortot, was ordered to be set up. But hardly was a model raised on the dome, in 1838, than the hisses of the critics brought it down again. Until 1852 the dome remained uncrowned. Then the Government placed on it the wooden cross which remained there until late in March, 1871, when the Communists sawed it off. After peace and order were restored, M. Jules Simon caused to be put up the iron cross which has now been ordered away. Why the cross should be taken down can only be explained on the hypothesis that the City Government is opposed to any religious symbols on the public buildings which are within its control. To pay out the $6,000, however, seems a wasteful use of money. But the Municipal Government of Paris, like its counterparts in some American cities, is always ready to spend other people's money foolishly. — *Boston Transcript.*

PAVEMENT MATERIAL AND LOCOMOTION. — It may be thought that the material of which a sidewalk is constructed is of small importance so long as a sidewalk is there. This is a great mistake. The influence that the surface of a sidewalk has upon the ease with which a pedestrian gets about can only be realized by close observation and experiment. Take a number of sidewalks, all slightly undulating, and experiment. It will be found that a polished stone sidewalk requires fully one-half more exertion to traverse than an equal distance of granite pavement requires. A brick walk gives much less fatigue, while the iron walk, cast with little projections, is by far the easiest of any to walk upon. My attention was called to this while making a series of walking races with a man who invariably passed me on going home. Do what I could, I could not keep pace with him on the smooth stone. One night, however, I chanced to take to the iron walk that was inside the stone, and to my surprise found that I excelled him in speed, with far less fatigue than when being regularly distanced on the same footing. — *Engineer, in New York Mail and Express.*

TRACTION OVER DIFFERENT PAVEMENTS. — It is stated that if one horse can draw a certain load over a level road on iron rails, it will take one and two-third horses to draw the same load on asphalt, three and one-third horses to draw it on the best Belgian block, five on the ordinary Belgian pavement, seven on good cobblestones, thirteen on bad cobblestones, twenty on an ordinary earth road, and forty on a sandy road. — *Sanitary News.*

TRADE SURVEYS

THE ordinary business man should take very little account of the wars and rumors of wars talked about in the daily and weekly trade and financial journals. Do what they may a spirit of competition has set in which will render practically null combinations to arbitrate and arrest competition or to preserve prices at a normal limit It is to be expected that the wealthy producing and wealthy exchanging interests will make a valiant fight to maintain high earnings and margins and it is proper that they should do so, but all of their efforts and combinations to maintain a sort of supremacy to the universal law of competition will result in nothing but disappointment to them when the fight is finally over. Trade and trade methods are passing through a transitional period and some of the effects of these transitions are the depressing influences at work. Railroad managers may combine and scheme to formulate schemes and enter upon solemn agreements to do this and that and the other thing, and manufacturers may form associations and impose fines for violations, and manufacturers may come together and agree upon prices and rates and arrangements for the conducting of trade, but so far as preventing the downward tendency in prices, combinations and associations will prove valueless. All these conditions are absolutely necessary for the development of a better commercial system than we now have. Defects in doing business and in exchanging products will be gradually eliminated. These defects are the results of generations of growths and they can only be removed through the sharpest kind of competition and the greatest possible pressure that can be brought to bear against them. No harm will come to the vital interests of the people. The organizations of trusts harmful as they appear, will result in certain compensating advantages in trade that will make up for any temporary damage they may do. The Trusts as they exist are stimulating all outside financial interests to join in reorganizing trade methods and to put trade on a sounder basis. Existing methods will do for a small business but they will not for an immense business. The country is formulating new rules for its guidance. Its financiers are devising or attempting to devise a new financial system. Its railroad managers are attempting to form combinations that will eventually control the entire railway system of the country. Its Boards of Trade are discussing in their annual conventions, measures by which present methods can be improved and harmonized. Manufacturers are endeavoring to bring about a unanimity of interest in various branches by which production can be controlled within safe limits. All of these efforts are right and necessary and will continue till an organization in ways and methods has been effected. The same change is now going on in business affairs that was brought about in our political affairs by the Civil War. Prior to that contest there was but little of the spirit of nationality among the people. That contest brought people in all quarters of the Union into bonds of sympathy. Trade contests are now bringing about an analogous condition. Capital which has been hugging the East and its large cities is irrigating remote sections of the country and is earning its owners good returns. There is a steady outflow of people all over the country and industrial sections are springing up by the score. New conditions and new possibilities are developing themselves. This is creating elements of strength to business and trade interests. But little new business will be done for the next thirty days. Manufacturers want to see their way clearly. Strange, to say, there is an upward tendency in prices in many directions. Textile manufacturers are between two fires. First, an advance has taken place in wool. Second, the possibility of increased importations of foreign dry goods in the event of an advance in this market. Leather has advanced but boot and shoe makers are still selling goods at old prices. Iron and steel products remain firm in price, in spite of the increasing output. Nearly all railroad companies will be buyers of rolling stock. Locomotives and railway material in general will be in excellent demand during the coming winter. Within two or three weeks large contracts for shipping of various kinds have been placed in the ship-yards of Maine and on the Delaware. Consumers of coal are waiting till prices settle. They seem to entertain the opinion in a general way that there will be a heavy increase in production this winter, and that in consequence, prices in the early spring will weaken and that they will not contract for next summer's supplies in view of this possible drop in prices. Everything points to a very active demand for all the available capital of the world. More money has flown away from British financial centres within the past two years into foreign countries than during the previous five or six years. Schemes are looming up in South America, Australia and in other foreign countries calling for capital and an equalization is going on not only in money but in population which will have a very important influence upon financial and political conditions of all countries. The evils of congestion which have afflicted European countries so long, will be more speedily improved by this distribution now being stimulated by the inducements of profit than by all the legislation that short-sighted statesmen or Government-hating anarchists can bring about.

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